IN THE CLAIMS:

Please amend claims 1 and 2. The status of all claims is as follows:

1. (Currently Amended) An apparatus for removing particles from a fluid, the apparatus comprising:

a separation chamber having an annular tunnel to accept fluid flow;

a plurality of inlet vanes within the annular tunnel having a discharge angle for deflecting the fluid flow to impart a helical flow to fluid in the separation chamber, each of the plurality of inlet vanes having a surface ~~with an arced shape~~that is curved in three dimensions such that a deflection angle of the surface of each of the plurality of inlet vanes varies substantially smoothly from an angle at an entrance of the vanes allowing fluid flow along an axial direction as the fluid enters the vanes to the discharge angle at an exit of the inlet vanes as the fluid exits the vanes;

an outlet in fluid communication with the separation chamber, the outlet being configured to pass fluid having the particles removed;

a collection device for collecting the particles;

a pressure generating device for moving the fluid through the inlet vanes and through the separation chamber.

2. (Currently Amended) The apparatus of claim 1 wherein the inlet vanes are shaped such that flow of the fluid along an entire surface of each of the inlet vanes is in

~~an arced~~an elliptical motion, and in a substantially circular motion when viewed along the axial direction from the entrance of the inlet vanes to the exit of the inlet vanes.

3. (Original) The apparatus of claim 2 wherein the annular tunnel is defined between an inner member and an outer cylinder, and wherein each the inlet vanes is configured so that, for an arbitrary point on the surface of the inlet vane,

$$z = r\sqrt{\frac{\pi}{90}\beta - (\frac{\pi}{180}\beta)^2}$$, where

z = distance along the axial direction between an entrance of the vane along an x-y plane, and the arbitrary point;

r = radial position of the arbitrary point on the x-y plane, r $\geq$ the radius of the inner member, and the radius of the outer cylinder $\geq$ r; and

β = discharging angle of the vane projected on the x-y plane for the arbitrary point, in degrees.

4. (Original) The apparatus of claim 2 wherein the annular tunnel is defined between an inner member and an outer cylinder, and each of the plurality of inlet vanes is defined between an inner contour intersecting the inner member and an outer contour intersecting the outer cylinder, and wherein a tangential angle of both the inner contour and the outer contour varies substantially smoothly from an initial tangential angle that is parallel with the axial direction to an end tangential angle equal to the discharge angle.

5. (Original) The apparatus of claim 1 wherein the plurality of vanes are disposed symmetrically about the annular tunnel.

6. (Original) The apparatus of claim 1 wherein each of the plurality of vanes are formed integrally with the inner member.

7. (Original) The apparatus of claim 1 wherein the apparatus further comprises a plurality of particle separation modules, each of the particle separation modules including the separation chamber having the annular tunnel and the plurality of inlet vanes.

8. (Original) The apparatus of claim 7 wherein the outlet comprises a plurality of individual fluid outlets in fluid communication with the separation chamber of each of the plurality of particle separation modules.

9. (Original) The apparatus of claim 7 wherein the plurality of particle separation modules is formed into a casing.

10. (Original) The apparatus of claim 7 wherein the modules are arranged in an array.

11. (Original) The apparatus of claim 1 wherein the apparatus further comprises at least one multi-annular particle separation module having a plurality of the annular tunnels arranged concentrically, each of the plurality of the annular tunnels including a plurality of the inlet vanes.

12. (Withdrawn) An apparatus for removing particles from a fluid, the apparatus comprising:

a fluid pressure generating device;

a plurality of particle separation modules disposed within a casing, each of the particle separation modules comprising:

a separation chamber in fluid communication with the fluid pressure generating device, the separation chamber comprising an annular tunnel through which the fluid flows, further comprising a plurality of inlet vanes within the annular tunnel to impart a helical flow to the fluid and separate the particles from the fluid;

an outlet in fluid communication with the separation chamber, the outlet being configured to receive the one or more particles separated from the fluid, and to pass fluid having the one or more particles removed.

13. (Withdrawn) The apparatus of claim 12 wherein the casing comprises a plurality of removably connected sections.

14. (Withdrawn) The apparatus of claim 13 wherein the plurality of separable sections comprises a first section including the inlet vanes and at least part of the annular tunnel, a second section including at least part of the separation chamber, and a third section including the outlet.

15. (Withdrawn) The apparatus of claim 14 wherein the first section comprises an inner member, a section of an outer cylinder, and the plurality of inlet vanes.

16. (Withdrawn) The apparatus of claim 12 wherein the outlet includes a collection bunker for collection of the particles and at least one fluid outlet disposed within the collection bunker.

17. (Withdrawn) The apparatus of claim 16 further comprising a chute connected to the collection bunker for collection of the particles.

18. (Withdrawn) The apparatus of claim 12 further comprising:

a plurality of outlets, the outlets having collection bunkers connected for moving the particles between the collection bunkers.

19. (Withdrawn) The apparatus of claim 12 wherein the plurality of modules are arranged in both rows and columns.

20. (Withdrawn) The apparatus of claim 12 wherein each of the plurality of inlet vanes has a surface with an arced shape such that a deflection angle of the surface of each of the plurality of inlet vanes varies substantially smoothly from an angle at an entrance of the inlet vanes allowing fluid flow along an axial direction as the fluid enters the vanes to the discharge angle at an exit of the inlet vanes as the fluid exits the vanes.

21. (Withdrawn) The apparatus of claim 20 wherein each of the inlet vanes are shaped such that flow of the fluid along an entire surface of each of the inlet vanes is in an arced motion.

22. (Withdrawn) The apparatus of claim 21 wherein the annular tunnel is defined between an inner member and an outer cylinder, and wherein each the inlet vanes is configured so that, for an arbitrary point on the surface of the inlet vane,

$$z = r\sqrt{\frac{\pi}{90}\beta - (\frac{\pi}{180}\beta)^2}$$, where

z = distance along the axial direction between an entrance of the vane along an x-y plane, and the arbitrary point;

r = radial position of the arbitrary point on the x-y plane, r $\geq$ the radius of the inner member, and the radius of the outer cylinder $\geq$ r; and

β = discharging angle of the vane projected on the x-y plane for the arbitrary point, in degrees

23. (Withdrawn) An apparatus for removing particles from a fluid, the apparatus comprising:

an inner particle separation device and at least one outer concentric particle separation device, each of the inner and outer particle separation devices comprising a separation chamber having an inlet for receiving the fluid, the separation chamber comprising an annular tunnel through which the fluid flows, the annular tunnel comprising a plurality of inlet vanes for imparting a helical flow to the fluid as it passes through the separation chamber;

at least one outlet in fluid communication with the separation chamber of the inner and outer particle separation device, the outlet receiving one or more particles separated from the fluid and passing fluid having the one or more particles removed.

24. (Withdrawn) The apparatus of claim 23 wherein each of the particle separation devices comprises an inner member and an outer cylinder such that the annular tunnel of each of the particle separation devices is defined by each respective inner member and outer cylinder.

25. (Withdrawn) The apparatus of claim 24 wherein the outer cylinder of the inner particle separation device defines the inner member of a next outer particle separation device.

26. (Withdrawn) The apparatus of claim 23 further comprising:

at least one misting nozzle for wetting the fluid and the one or more particles.

27. (Withdrawn) The apparatus of claim 23 wherein the plurality of inlet vanes are disposed within the annular tunnel of the inner particle separation device and the outer particle separation device.

28. (Withdrawn) The apparatus of claim 27 wherein each of the plurality of inlet vanes has a surface with an arced shape such that a deflection angle of the surface of each of the plurality of inlet vanes varies substantially smoothly from an angle at an entrance of the inlet vanes allowing fluid flow along an axial direction as the fluid enters the vanes to the discharge angle at an exit of the inlet vanes as the fluid exits the vanes.

29. (Withdrawn) The apparatus of claim 28 wherein each of the inlet vanes are shaped such that flow of the fluid along an entire surface of each of the inlet vanes is in an arced motion.

30. (Withdrawn) The apparatus of claim 29 wherein the annular tunnel is defined between an inner member and an outer cylinder, and wherein each the inlet vanes is configured so that, for an arbitrary point on the surface of the inlet vane,

$$z = r\sqrt{\frac{\pi}{90}\beta - (\frac{\pi}{180}\beta)^2}$$, where

z = distance along the axial direction between an entrance of the vane along an x-y plane, and the arbitrary point;

r = radial position of the arbitrary point on the x-y plane, r $\geq$ the radius of the inner member, and the radius of the outer cylinder $\geq$ r; and

β = discharging angle of the vane projected on the x-y plane for the arbitrary point, in degrees.